

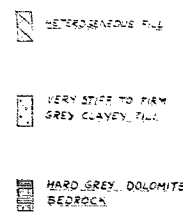
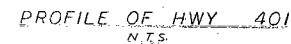
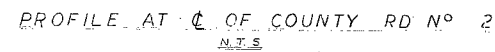
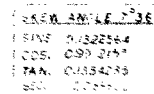
#61-F-217C

W.P. #135-59

HWY #401 &

BRINSTON RD.

IROQUOIS



NOTE

STRUCTURE TO BE BUILT OVER WEST BOUND LANES
UP TO CONSTRUCTION JOINT.
WHILE TRAFFIC USES THE EAST BOUND LANES
AFTER CONCRETE HAS ATTAINED 3000 P.S.I. THE
FALSEWORK TO BE REMOVED AND TRAFFIC DETOURED
ALONG WEST BOUND LANES, AND THE REMAINING
PORTION OF THE STRUCTURE COMPLETED.
CURBS AND ASPHALT TO BE CAST ON FULLY
COMPLETED STRUCTURE



NOTES

TO DISTRICT ENGINEER

CONCRETE WORK ON THIS STRUCTURE MUST NOT BE COMMENCED UNTIL ALL MEASUREMENTS TO FIX CONTROL POINTS HAVE BEEN DETERMINED AND CHECKED BY THE DISTRICT ENGINEER.

TO CONTRACTOR

STRUCTURE TO BE BUILT IN ACCORDANCE WITH FORM A-9 AND THE SPECIAL PROVISIONS, EXTRA CODES OF WHICH MAY BE OBTAINED FROM THE DISTRICT ENGINEER.

CONCRETE MIX

MINIMUM STRENGTH AT 28 DAYS	MAXIMUM SIZE OF AGGREGATE
4000 PSI	

STEEL WIRE MESH

--	--

REINFORCING AND UTILITY SUPPLIED, DESIGNED BY THE DISTRICT ENGINEER. SEE SPECIAL PROVISIONS & SPECIFICATIONS FOR THE STANDARD.

CONCRETE

CONCRETE SHALL BE PLACED IN THE MANNER SPECIFIED IN THE STANDARD. THE PROPOSED ELEVATIONS VIEW OF THE DEPARTMENT DOES NOT GUARANTEE THE ACCURACY OF THIS REPORT OR THE ABRIDGED VERSION THEREOF ON THESE PLANS.

SURFACE COVER ON REINFORCING STEEL

1. OTHERS	1/2"
2. REINFORCEMENT	3/4" OR AS SHOWN
3. RAILROADS	1/2"

CONSTRUCTION NOTES

ALL EXPOSED EDGES TO BE CHAMFERED 2" IF EXCEPT AS NOTED.

ALL CONSTRUCTION WORKS MUST BE APPROVED BY THE PROJECT ENGINEER.

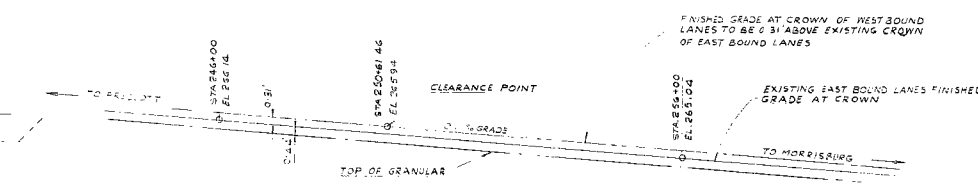
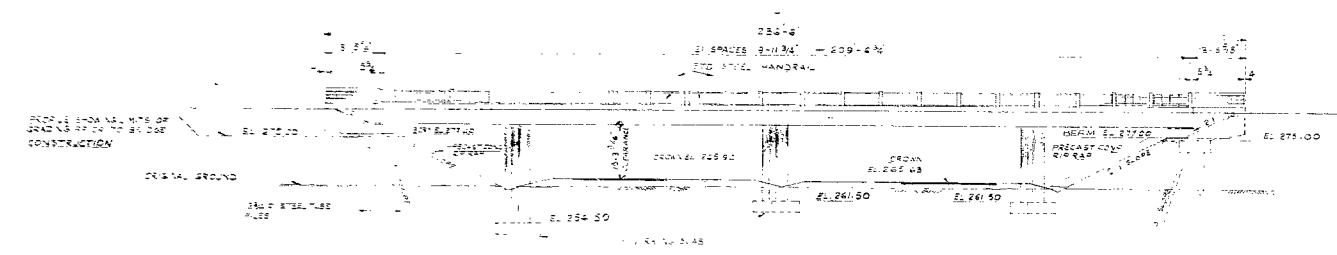
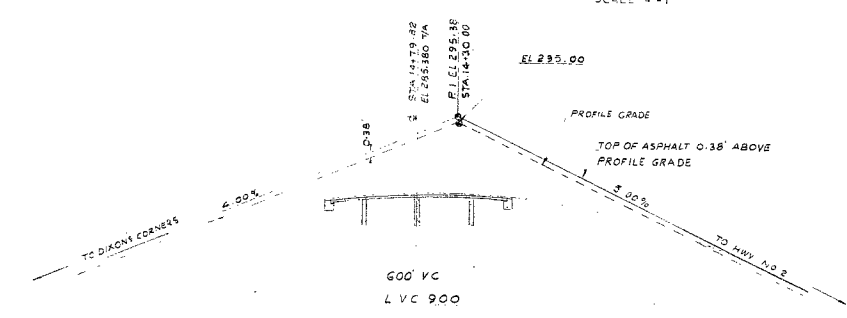
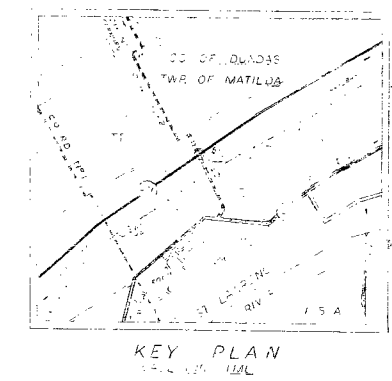
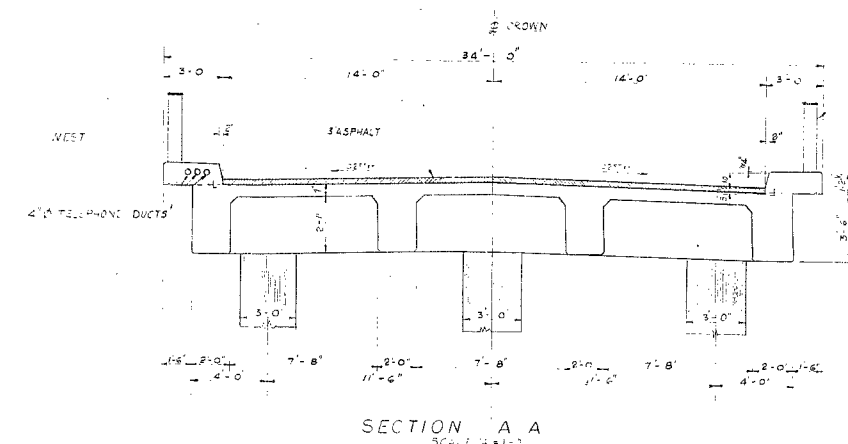
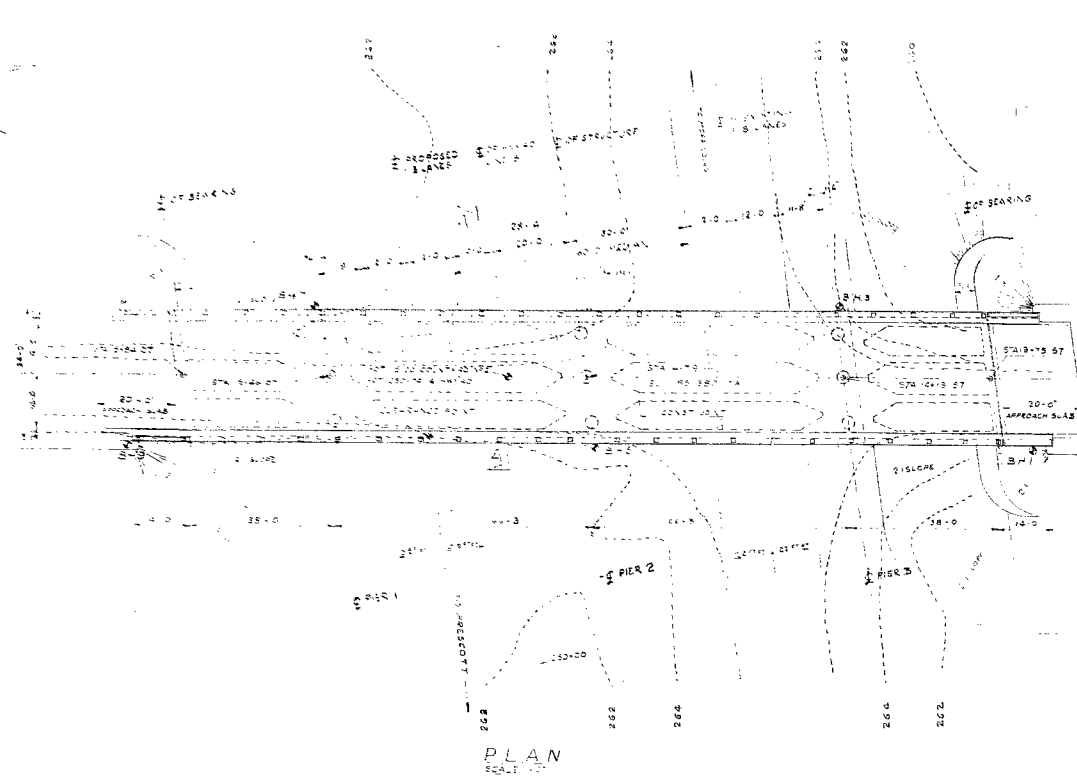
- THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT THE FINAL DECK ELEVATIONS CONFORM WITH THE ELEVATIONS SHOWN.
- THE CURBS SHALL NOT BE PLACED PRIOR TO STIKING THE FALSEWORK UNLESS THE DISTRICT ENGINEER IS SATISFIED THAT THE FINAL CURB PROFILE WILL CONFORM TO THAT SHOWN ON THE PLAN.

Sails:

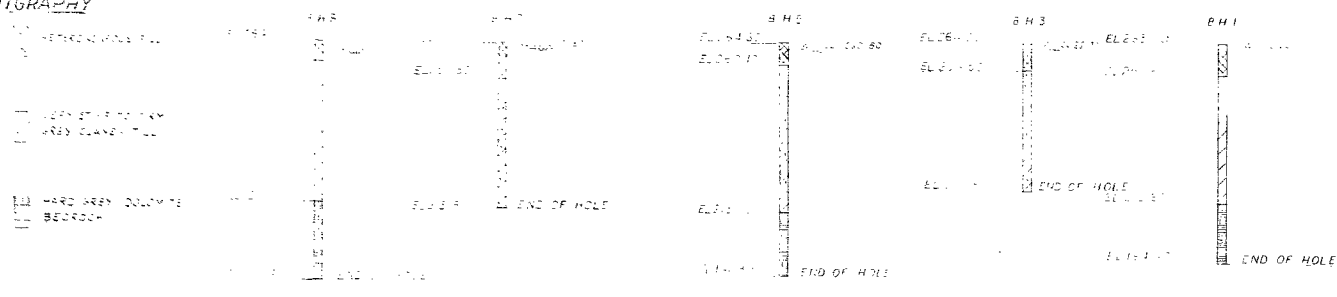
W.P. 135-59

DEPARTMENT OF HIGHWAYS - ONTARIO BRIDGE OFFICE - TORONTO																												
<div style="display: flex; justify-content: space-between; padding: 5px;"> MATILDA TWP. BRIDGE N^o </div>																												
<div style="display: flex; justify-content: space-between; padding: 5px;"> THE KING'S HIGHWAY NO. 401 DIST. NO. 9 </div>																												
<div style="display: flex; justify-content: space-between; padding: 5px;"> CD. DUNDAS </div>																												
<div style="display: flex; justify-content: space-between; padding: 5px;"> TWP. MATILDA LOT 16219 CON. </div>																												
PRELIMINARY																												
APPROVED																												
<div style="display: flex; justify-content: space-between; padding: 5px;"> BRIDGE ENGINEER DESIGN ENGINEER </div>																												
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">DESIGN</td> <td style="width: 15%;">A K</td> <td style="width: 15%;">CHECK</td> <td style="width: 15%;">CONTRACT NUMBER</td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> </tr> <tr> <td>DRAWING</td> <td>R A S</td> <td>CHECK</td> <td>J M R</td> <td></td> <td></td> </tr> <tr> <td>TRACING</td> <td></td> <td>CHECK</td> <td></td> <td></td> <td></td> </tr> <tr> <td>DATE</td> <td>MARCH 1964</td> <td></td> <td>LD DIME H 20 5 16</td> <td colspan="2">DRAWING NUMBER D 4851-P1</td> </tr> </table>					DESIGN	A K	CHECK	CONTRACT NUMBER			DRAWING	R A S	CHECK	J M R			TRACING		CHECK				DATE	MARCH 1964		LD DIME H 20 5 16	DRAWING NUMBER D 4851-P1	
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TRACING		CHECK																										
DATE	MARCH 1964		LD DIME H 20 5 16	DRAWING NUMBER D 4851-P1																								

[illegible]



STRATIGRAPHY



BORE HOLE DETAILS NTS

NOTE
STRUCTURE TO BE BUILT OVER WEST BOUND LANES UP TO CONSTRUCTION JOINT. WHILE TRAFFIC USES THE EAST BOUND LANES AFTER CONCRETE HAS ATTAINED 3000 P.S.I. THE FALSEWORK TO BE REMOVED AND TRAFFIC DETOURED ALONG WEST BOUND LANES, AND THE REMAINING PORTION OF THE STRUCTURE COMPLETED CURBS AND ASPHALT TO BE CAST ON FULLY COMPLETED STRUCTURE

NOTES

TO DISTRICT ENGINEER
CONCRETE WORK ON THIS STRUCTURE MUST NOT BE COMMENCED UNTIL MONUMENTS TO FIX CONTROL POINTS HAVE BEEN ERECTED AND CHECKED BY THE DISTRICT ENGINEER.

TO CONTRACTOR
STRUCTURE TO BE BUILT IN ACCORDANCE WITH FORM N-9 AND THE SPECIAL PROVISIONS, EXTRA COPIES OF WHICH MAY BE OBTAINED FROM THE DISTRICT ENGINEER.

CONCRETE MIX

	MINIMUM STRENGTH AT 28 DAYS	MAXIMUM SIZE OF AGGREGATE
STRUCTURE (ALL)	3,000 P.S.I.	3/4"

APPROVED ADMIXTURES SUPPLIED BY THE CONTRACTOR WILL BE ADDED TO ALL CONCRETE AS SPECIFIED BY THE ENGINEER.

BORING DATA
THE COMPLETE SOIL INVESTIGATION REPORT BA1185 MAY BE EXAMINED AT THE BRIDGE OFFICE, DOWNSVIEW. THE DEPARTMENT DOES NOT GUARANTEE THE ACCURACY OF THIS REPORT OR THE ABRIDGED VERSION SHOWN ON THESE PLANS.

CLEAR COVER ON REINFORCING STEEL

FOOTINGS	3"	OR AS NOTED
ABUTMENT	3"	
DECK	2"	
HANDRAILS	1 1/2"	

CONSTRUCTION NOTES

- ALL EXPOSED EDGES TO BE CHAMFERED 1" X 1" EXCEPT AS NOTED.
- ALL CONSTRUCTION JOINTS MUST BE APPROVED BY THE BRIDGE ENGINEER.
- THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT THE FINAL DECK ELEVATIONS CONFORM WITH THE ELEVATIONS SHOWN ON THESE PLANS.
- THE CURBS SHALL BE BUILT TO THE FINISHED GRADE OF THE EAST BOUND LANES UNLESS THE DISTRICT ENGINEER IS SATISFIED THAT THE FINAL CURB PROFILE WILL CONFORM TO THAT SHOWN ON THESE PLANS.

REVISIONS:	DATE	BY	DESCRIPTION	REFERENCE PLANS	DESIGN ENGINEER			
					DESIGN	CHECK	APPROVED	DESIGN NUMBER
				E 3794-1	DESIGNED	CHECKED	APPROVED	
				E 3723	DESIGNED	CHECKED	APPROVED	
				E 3723-1	DESIGNED	CHECKED	APPROVED	

W.D. 135-59

DEPARTMENT OF HIGHWAYS-ONTARIO

BRIDGE OFFICE-TORONTO

MATILDA TWP. BRIDGE NO. 3

THE KING'S HIGHWAY NO. 401 DIST. NO. 9

CO. DUNDAS

TWP. MATILDA LOT 12 CON.

APPROVED

BRIDGE ENGINEER

DESIGN ENGINEER

DESIGN NUMBER D 4651-P1

Files for abutments

File tip & station 251.0

Safe Load per timber pile 15 Tons

Information given to John Curtis on Feb. 28, 1961.

RYS

Mr. A. M. Toye,

February 17, 1961.

Bridge Engineer.

FOUNDATION INVESTIGATION REPORT

Materials & Research Section.

by: H. Q. Golder & Associates, Ltd.

Attention: Mr. G. McCombie.

Re: Proposed Highway 401 Underpass,
Iroquois, Ontario, District #9.
W.P. 135-59.

Attached, we are sending you the report for
the above mentioned site submitted by the Consultant,
H. Q. Golder & Associates.

We have reviewed the report and find the factual
data well presented and the recommendations self-explanatory.
We believe that the given information will be adequate for
your future design work. However, should there be any ad-
ditional questions you would like to discuss, please feel
free to call on our Office.

AGG/WdeF

Attach.

cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
H. D. McMillan
J. Ford
L. E. Walker
J. E. Gruspier
A. Watt

Foundations Office
Gen. Files.

L. G. Soderman,
PRINCIPAL FOUNDATION ENGR.

Per:

for: Don de Lassik

(A. G. Sternac,
SUPERVISING FOUNDATION ENGR.)



ONTARIO

DEPARTMENT OF HIGHWAYS

Bridge Division,
April 21, 1961.

MEMORANDUM TO:

Mr. S. McCombie,
Bridge Planning Engineer,
Bridge Division.

RE: W.P. 135-59, Hwy. #401
at Princeton Road,
Matilda Br. #3.

received

We ~~need~~ a copy of a letter from J. B. Curtis of your office addressed to the Soils & Foundation Division asking for their comments. As the safety of any structure is the responsibility of the designer it will be appreciated if such letters asking for comments without the designer's knowledge are not done in the future.

The Bridge Design Office is the ruling body on such matters and will supply any structural information that is required.

LSF:go

C. S. Grebski,
Sr. Engineer,
Bridge Design Office.

PILES FOR ABUTMENTS

W.P. 135-59

NORTH ABT. DATA } similar
SOUTH ABT. DATA }

Profile Grade 282.0'

Formation Grade 272.0'

Original Ground 262.0'

SOIL CONDITIONS (BH #1)

Material - v. stiff to firm gray till

Shear Strength - C.L. to el. 250' $C = 4000$
Below 250' $C = 750$

REQUIRED

Length of 12 $\frac{3}{4}$ " ϕ TUBE PILES.

CALC.

$$Q_f = N_c A_b C_b + C.L. c_a$$

(Tomlinson 1957 - Vol I)

$$Q_f = Q_b + Q_a$$

$$L = 10.0' \text{ (into original ground)}$$

$$N_c = 9.0$$

$$A_b = \frac{1}{44} (12\frac{3}{4})^2 \cdot \frac{\pi}{4} = .385 \text{ sq. ft.}$$

$$c_a = f_c / 100 \text{ assume } f_c = 40\% \text{ of } c$$

$$c_a = .4 \times 2000 = 800 \text{ p.s.f.}$$

$$C = 3.34'$$

{ DRIVE TO EL. 252.0'

{ USE 15 T / PILE

$$Q_f = 9 \times .385 \times 4000 + 3.34 \times 20 \times 800$$

$$= 15.93 + 2672 = 42.65 \text{ T}$$

Mr. A. M. Toye,

Bridge Engineer.

Materials and Research Section,
(Foundations Office).

Attention: Mr. J. B. Curtis,
Bridge Location Engr.

April 24, 1961.

REVIEW OF PRELIMINARY PLAN

by: Foundations Office.

Re: W.P. 135-59 Hwy. 401
at Brinston Rd.,
Matilda Twp. Br. #3,
District #9.

We have reviewed the preliminary prints for the above structure and agree with the design as far as foundation requirements are concerned. The selected steel tube piles for the abutments should not be driven deeper than elevation 251.0'. The allowable bearing capacity of such piles should not exceed 15 tons per pile.

This particular case is definitely better suited for spread footings placed on embankment fills. The height of the fill at the footing location is only about 8 feet, and surely a good compaction of such a fill could be assured. If this portion of the embankment would be constructed of granular material, the required fill density - i.e., compactness could easily be obtained.

The subsoil investigation has revealed that the properties of the soil with depth are becoming inferior and therefore, a maximum pile driving depth had to be stipulated.

L. G. Soderman,
PRINCIPAL FOUNDATION ENGR.
Per:

AGS/MdeF

cc: Foundations Office
Gen. Files.

A. G. Stermac
(A. G. Stermac,
SUPERVISING FOUNDATION ENGR.)

PILES FOR ABUTMENTS

WP 135-59

$$G_f = N_c A_b C_b + C.L. C_a$$

Profile grade 261.0

Formation grade 270.0

Original ground 262.0

Factor strength G.L. to elev 250.0

below 250.0

C = 4000

C = 750

Using 12 BP 54

$$N_c = 9.0$$

$$A_b = 90$$

$$G_f = \frac{9 \times 11.78 \times 12}{14.4} \times \frac{4000}{2000} + 3 \times \frac{10}{12} \times \frac{2.5 \times 750}{2000}$$

$$= 17.6 + 23.4$$

$$= 41.0$$

$$\frac{G_f}{F_s} = \frac{41.0}{3} = 13.6 \text{ Tons}$$

GIVEN CONDITIONS.

- 4 span structure; 2 abutments & 2 piers
- piers supported on spread footings
- abutments supported on piles driven through the approach fills.

REQUIRED

LENGTH & TYPE OF PILES

FROM REPORT

- ELEV. ≈ 260 TO 212 FILL
V. STIFF TO FIRM
GR. CLAYEY TILL
- SHEAR STRENGTH $C \geq 500$ psf.

ASSUME: - HT. OF APPROACH FILL = 20 ft.

say bottom of pile cap ≈ 10 ft.
below grade

$$\therefore \text{TOP OF PILE } 264 + 10 + 2 = 276$$

- adhesion = 500 psf. from Elev. 276

$$Q_f = N_c A_b C_b + C.L.C_a \quad \text{Tomlinson 1957}$$

CLASS B TIMBER PILE, DIA. TIP = 8", AVG. DIA. 11", BUTT 14"

$$Q_f = 9 \left(\frac{\pi}{4} \right) \left(\frac{1}{144} \right) (11)^2 (500) + \frac{\pi (11)}{12} (L) (500)$$

$$= 2970 + 1440L$$

$$= 1.5 + .72L \quad \text{tons}$$

June 28

Larry:-

Chester Grebski (517)
would like to know the allowable
loads and required depths to obtain
loads, using steel tube or 'H' piles
for Matilda Twp. Br. 3 - W.P. 135-59

MdeF

$$Q_f = 1.5 + .72 L$$

Q	15.9	28.1	26.7	30.3	33.9	37.5	41	44.7
L	20	30	35	40	45	50	55	60
R _A	5.3	7.7	8.9	10.1	11.3	12.5	13.7	14.9

$$\frac{276}{60} = 216$$

R_A = allowable load with S.F. = 3

Tip 60 ft. pile would be near bedrock.

10 BP 42 x 60 ft.

$$Q_f = 9 \left(\frac{90}{12.35} \right) (500) + 4 \left(\frac{10}{12} \right) (60) (500)$$

$$= 386 + 100,000$$

$$\approx 50 \text{ tons}$$

∴ use 10 BP 42 driven to bedrock

to a 65 ft. in length.

RECOMMEND H bearing piles
 driven to bedrock.

————— H —————

$$\begin{array}{r} .72 \\ 20 \\ \hline 4.40 \\ 1.5 \\ \hline 15.9 \end{array}$$

$$\begin{array}{r} .72 \\ 30 \\ \hline 21.60 \\ 1.5 \\ \hline 23.10 \end{array}$$

$$\begin{array}{r} .72 \\ 35 \\ \hline 36.0 \\ 21.6 \\ \hline 57.60 \\ 1.5 \\ \hline 59.1 \end{array}$$

$$\begin{array}{r} 32.4 \\ 1.5 \\ \hline 33.9 \end{array}$$

$$\begin{array}{r} .72 \\ 40 \\ \hline 28.80 \\ 1.5 \\ \hline 30.3 \end{array}$$

$$\begin{array}{r} 36.0 \\ 1.5 \\ \hline 37.5 \end{array}$$

$$\begin{array}{r} 31.5 \\ 1.5 \\ \hline 33.0 \end{array}$$

$$\begin{array}{r} 42.0 \\ 1.5 \\ \hline 43.5 \\ 14.9 \\ \hline 58.4 \end{array}$$

TIMBER PILE, CLASS B, DIA. TIP = 8"

LENGTH = 25' i.e. TIP AT ELEV. 251

$$S = 1700 \text{ psf} - \text{BH 1}$$

$$= 4200 \text{ psf.} - \text{BH 5}$$

$$= 5000 \text{ psf.} - \text{BH 9}$$

$$\text{USE } S = 4000 \text{ psf}$$

$$Q_f = 9(0.35)(4000) + \pi \left(\frac{11}{12} \right) (25)(750)$$

$$= 12600 + 54000$$

$$= 66600 \text{ lbs}$$

$$= 33.3 \text{ tons, F.S.} = 3.0$$

$$R_A = \underline{11.1 \text{ tons}}$$

12" PIPE PILE x 25'

$$Q_f = 9(.785)(4000) + \pi \left(\frac{12}{12} \right) (25)(750)$$

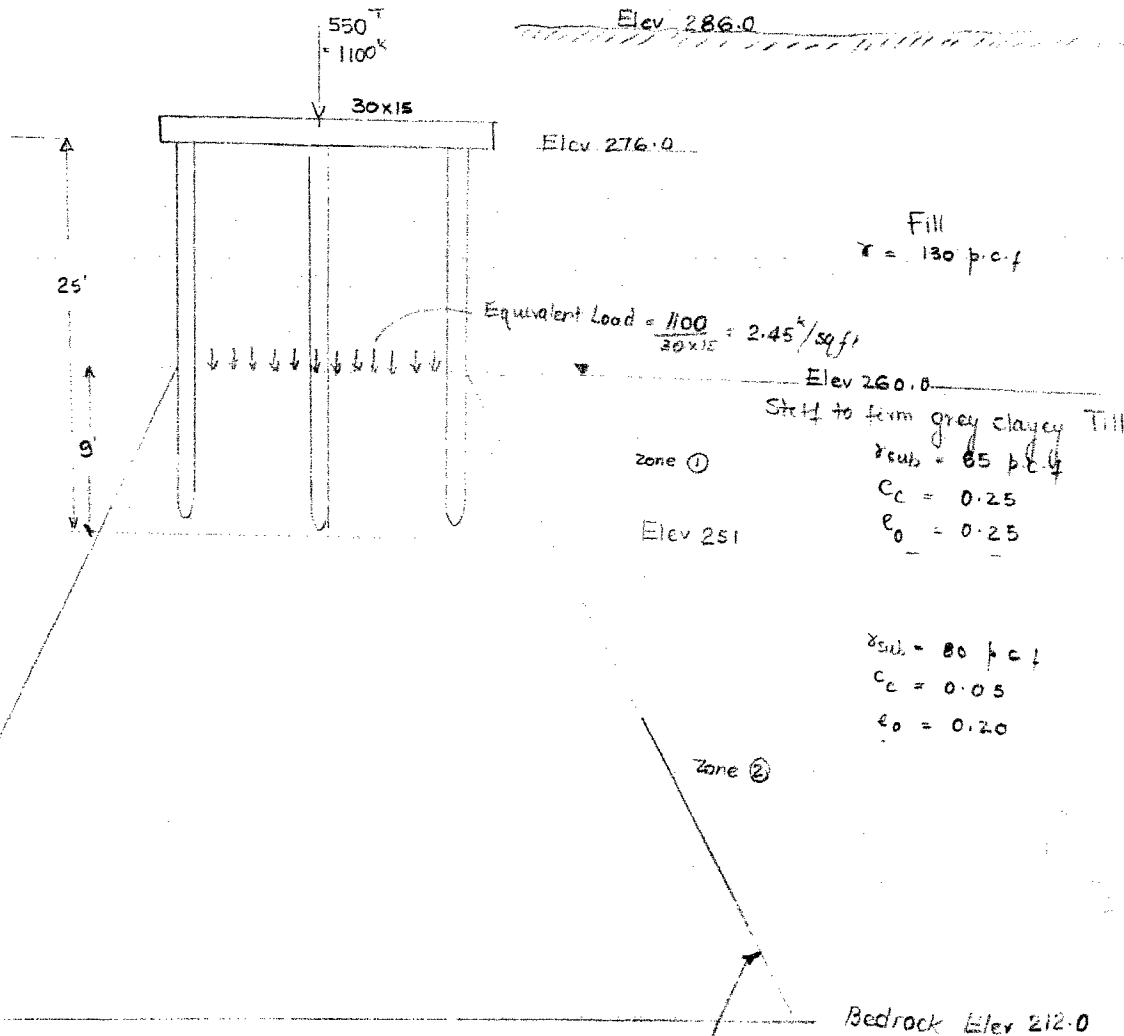
$$= 28200 + 54000$$

$$= 41.1 \text{ tons F.S.} = 3.0$$

$$R_A = \underline{13.7 \text{ tons}}$$

ABUTMENT REACTIONS 450 & 550 tons

Settlement of 25 ft Pile



Calculations for Value of P_0

Assuming the profile grade of the proposed approach = 286.0
Water table = 260.0

Wt of soil above water table = $\frac{26 \times 130}{1000} = 3.48^k$

Wt of soil to centre Zone ① = $\frac{4.5 \times 65}{1000} = 0.29^k$

P_0 for Zone ① = 3.77^k

$$\begin{aligned} \text{Similarity } P_0 \text{ for Zone 2} &= \frac{4.5 \times 65}{1000} + \frac{19.5 \times 80}{1000} + P_0 \text{ of zone ①} \\ &= 0.29^k + 1.56^k + 3.77^k \\ &= 6.62^k \end{aligned}$$

Computations for values of Δb :

$$\text{Middle of Zone ①} = (30 + 2 \times 2.25)(15 + 2 \times 2.25) = 672.5 \text{ sq ft.}$$

$$\Delta b \text{ middle of zone ①} = \frac{2.45 \times 450}{672.5} = \underline{\underline{1.64^k/\text{sq ft}}}$$

$$\text{Middle of Zone ②} = (30 + 2 \times 14.25)(15 + 2 \times 14.25) = 2540 \text{ sq ft.}$$

$$\Delta b \text{ middle of zone ②} = \frac{2.45 \times 450}{2540} = \underline{\underline{0.435^k/\text{sq ft}}}$$

$$S = \frac{H \times C_c}{1 + e_0} \log \left(\frac{P_0 + \Delta b}{P_0} \right)$$

Settlement Computations:

$$\begin{aligned} \text{Zone ①} &= \frac{9 \times 12 \times 0.25}{1 + 0.25} \log \left(\frac{3.77 + 1.64}{3.77} \right) \\ &= 22 \times \log^{0.668} 1.435 \\ &= 3.7'' \end{aligned}$$

$$\begin{aligned} \text{Zone ②} &= \frac{39 \times 12 \times 0.05}{1 + 0.20} \log \left(\frac{6.62 + 0.435}{6.62} \right) \\ &= 23.4 \times 0.0273 \\ &= 0.64'' \\ \Delta_c &= \underline{\underline{4.33''}} \end{aligned}$$

Add 15% for elastic Settlements

$$\begin{aligned} \Delta_c + \Delta_s &= \frac{0.65}{4.98''} \text{ Say } 5'' \end{aligned}$$

Department of Highways

COPY

For the information of

Mr. B. R. Davis,
Bridge Design Engineer,
Department of Highways,
Downsview, Ontario.

Bridge Division,
April 20, 1961.

MEMORANDUM TO:

Mr. L. G. Soderman,
Principal Soils & Foundation Eng.,
Department of Highways,
Room 107,
Downsview, Ontario.

Attention: Mr. A. C. Stermac

RE: W.P. 135-59 Hwy. 401
at Brinston Rd.
Matilda Twp. Br. #3

Enclosed find two prints of the preliminary
plan for the above structure.

The foundation report prepared by H. Q. Golder
does not suggest the use of piles - a matter which
you and I discussed by telephone February 28, 1961.
You advised us that class 'B' timber piles driven
to elevation 251 could sustain a load of 15 tons
per pile. The designer has chosen to use 12"
diameter, steel tube piles. Would you kindly let
us have your comments.

JBC/et

cc. B. R. Davis

J. B. Curtis,
Bridge Location Engineer.

*What is the
about class 2?
It's new to me!
J.B.*

OVER



ONTARIO

DEPARTMENT OF HIGHWAYS

Bridge Division,
April 20, 1961.

MEMORANDUM TO:

Mr. L. G. Soderman,
Principal Soils & Foundation Eng.,
Department of Highways,
Room 107,
Downsview, Ontario.

Attention: Mr. A. G. Stermac

RE: W.P. 135-59 Hwy. 401
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per pile. The designer has chosen to use 12"
diameter, steel tube piles. Would you kindly let
us have your comments.

JBC/et

J. B. Curtis,
Bridge Location Engineer.

cc. B. R. Davis

{ Use 12 $\frac{3}{4}$ " ϕ Tube Piles
Drive to el. 252.0 (10.0' into original ground)
Use Design load of 15 tons E.F. of 3 approx

If all piles are used then we should be able
to maintain el. 252.0 and maintain load
on each pile.

OVER



$$P_0 = 15 \times 70$$

$$15.0 \quad 1000 \quad 0.5 T$$

$$P_0 = 200$$

$$e_0 = 0.19$$

$$e_1 = 0.155$$

$$\frac{e_0 - e_1}{1 + e_0} = \frac{.19 - .155}{1.19} = \frac{.035}{1.19}$$

$$\frac{350}{1190}$$

$$\frac{1}{4}$$

$$\frac{3}{4}$$

$$\frac{235}{220} = 1.068$$

$$\frac{150}{140} = 1.071$$

$$\frac{150}{140} = 1.071$$

OFFICE LOCATION
DOWNSVIEW AVE.
KEELE ST. - HIGHWAY 401
TORONTO, ONTARIO.



ONTARIO
DEPARTMENT OF HIGHWAYS

POSTAL ADDRESS
DEPARTMENT OF HIGHWAYS
PARLIAMENT BUILDINGS,
TORONTO 2, ONTARIO.

Bridge Division,
February 28, 1961.

MEMORANDUM TO:

Mr. B. Davis,
Bridge Design Engineer,
Department of Highways,
Downsview, Ontario.

RE: W.P. 135-59,
Matilda Twp. Bridge #3,
Hwy. 401, District #9.

Attached please find signed plans for the structure:

Site Plan	E 3794-1
Plan	F 3723
Profile	F 3723-1
Foundation Report	BA 1185
Bridge Location Report	By J. Curtis

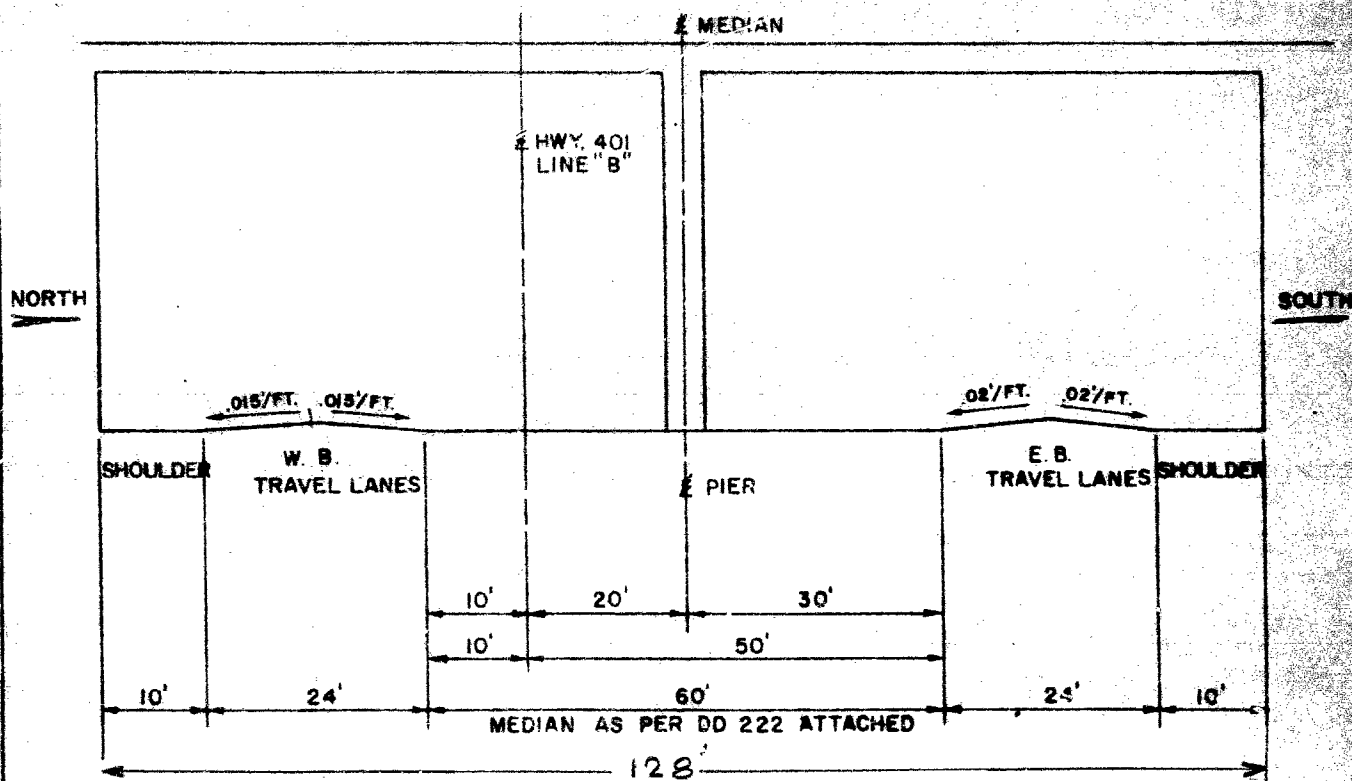
Preliminary plans for the above structure should be ready three weeks and the completed tracing by July 12, 1961.

The drawing number for this bridge is D 4851.

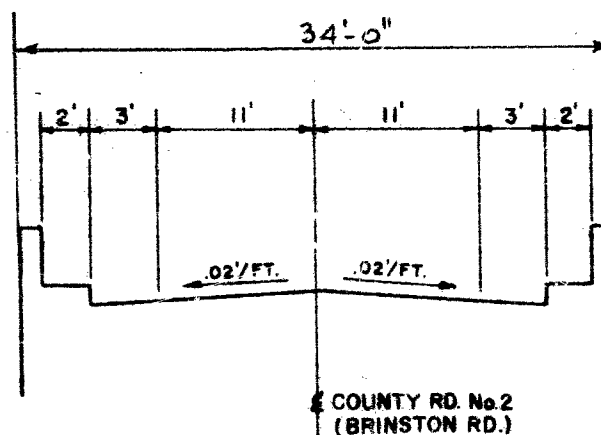
FM/mg

c.c. J. Ford,
S. Markiewicz.

F. Murray,
for S. McCombie,
Bridge Planning Engineer.

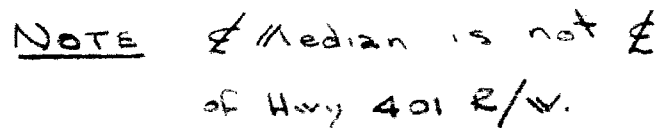


15'-3" VERTICAL CLEARANCE REQUIRED OVER ALL TRAVEL LANES

CROSS-SECTION OF HWY. 401 UNDER BRINSTON ROADCROSS-SECTION OF BRINSTON ROAD OVER HWY. 401NOTES:

FINISHED GRADE AT CROWN OF HWY. 401 W. B. LANES TO BE 0.31' ABOVE EXISTING CROWN OF FINISHED GRADE OF E. B. LANES. THE EXISTING CROWN OF FINISHED GRADE OF E. B. LANES IS SHOWN ON PROFILE.

PROFILE GRADE OF BRINSTON RD. IS 0.38' BELOW FINISHED GRADE AT CROWN
HANDRAIL TO BE D. H. O. STANDARD STEEL.



See Bridge Planning Report

\$ approved bridge cross-section

PROFILE GRADE is the top of the granular base course at the C/L of the pavement, prior to the placing of the 5/8" crushed gravel driving surface or the pavement.

NOTES:

1. The location and cross - section of the roadside ditch may be altered as required, to preserve valuable trees.
2. Guide rails are required on 2:1 slopes.
3. Top soil to be removed for full width of future granular base courses under fills 4 ft. or less in height.

Total Depth of Granular Base Courses	Distance 'X'	Distance 'Y'
12"	28.9'	23.4'
15"	30.0'	24.5'
18"	31.1'	25.6'
21"	32.3'	26.8'
24"	33.4'	27.9'
27"	34.5'	29.1'
30"	35.7'	30.2'
36"	37.9'	32.4'

W. P. 135-59

DEPARTMENT OF HIGHWAYS - ONTARIO

DIVIDED CONTROLLED ACCESS HIGHWAY GRADING SECTION-EARTH FILL

60 FT. MEDIAN

Drawn by Z P

Traced by Z.P.

Checked by Ks

Passed by P.W.

APPROVED

Oct. 11/60

Date _____


Road Design Engineer

BRIDGE PLANNING REPORT ON
THE STRUCTURE TO BE LOCATED
ON C.A.H. NO. 401 AT BRINSTON RD.

DISTRICT 9

MATILDA TWP. BRIDGE #3

W.P. 135-59

Work Project No. 135-59
Bridge Name - Matilda Twp. Br. #3
Hwy. No. 401
District 9 (Ottawa)

Location

County Dundas
Township Matilda
Concession I
Lots 18 & 19

Reference Plans and Reports

Site Plan	E 3794-1
Plan	F 3723
Profile	F 3723-1
Foundation- Report	BA 1185

Design Criteria (dated June 16/60)

Pavement 2 x 24'
Shoulders as per Road Design Stds.
Median 60' (Offset from & 401)

Proposed Work

To construct an underpass at the junction of Hwy. 401
and County Rd. #2 (Brinston Rd.)

Proposed Vertical Alignment

Hwy. 401 is paved for two lanes on the south side of the median. The grade shown for Hwy. 401 is the existing grade for these lanes on top of the asphalt. The north, or west-bound lanes are to be constructed of concrete.

It is assumed that the top of asphalt of the E.B. lanes is 5 $\frac{1}{4}$ " above the profile grade. The profile grade of the W.B. lanes is 9" below the finished concrete pavement. Since both profile grades are to be kept at the same elevation, (see Road Design Field Inspection Report) the finished grade on top of the concrete pavement at the crown will be 3 $\frac{3}{4}$ inches above the existing crown of the E.B. Lanes on the top of asphalt.

A acceptable grade could be set over the railway, should a structure at some time be constructed at that location. The profile grade of Brinston Rd. is 0.38' below finished grade at the crown.

W.P. 135-59
Matilda Twp. Br. #3

Proposed Horizontal Alignment

Both Hwy. 401 and Brinston Road are on tangent in the vicinity of the proposed structure.

It should be noted that the E.B. lanes have been constructed on the basis of a 100 foot median i.e. 62' from the centre line of the 24' pavement to line "B". Since the south lane was built there has been a change in policy and it has been decided to use a 60 foot median through underpass structures. Thus, the distance from Line "B" to the centreline of the 24 foot W.B. pavement will be 22 feet.

The chainage equation as given on the plans will not apply to the centre point of the structure.

The skew on the bridge will be $7^{\circ}-36'$.

Cross-Sections

Highway 401

The north (W.B.) lanes of Hwy. 401 will have concrete pavement with a cross-fall of 0.015' per foot while the existing E.B. lanes are of asphalt and have a cross-fall of 0.02' per foot.

The intersection will be only a grade separation with Hwy. 401 having the following cross-section 10' shoulder, 24' pavement, 60' median, 24' pavement and 10' shoulder.

County Road #2 (Brinston Rd.)

The bridge will be considered a long structure and will have the following cross-section:

2' curb, 3' clearance, 2 x 11' lanes, 3' clearance, 2' curb.

The cross-fall on the bridge will be 0.02'/ft.

Services

There are numerous Bell Telephone Wires on the West side of Brinston Rd.

The Bell Telephone Company has requested that we make provision for three fibre ducts in the bridge.

There is a four wire hydro service on the East side of Brinston Rd. which will have to be re-located.

W.P. 135-59
Matilda Twp. Br. #3

Services--cont'd

As indicated on the plan, there is a "Trans Northern Pipeline" at the north end of the grading of the approach ramps.

There will very likely be no illumination on this structure.

Foundation Data

The foundation investigation carried out by Golder and Associates is presented in report # BA 1185. The recommendations are self-explanatory and no further comment on them will be made here.

The Materials & Research section has further stated that class "B" timber piles (8" tip with 12" butt) driven to elevation 251 can sustain a load of 15 tons per pile.

Construction and Detours

As mentioned above, Hwy. 401 is open for two lanes the A.A.D.T. on which was 900 vehicles (1959). There appears to be no problem in detouring Hwy. 401 traffic from E.B. lanes to W.B. lanes and back to E.B. lanes, which presumably is the cheapest method of detouring traffic at this location. In order to facilitate the stage construction required for this type of detour, it would appear desirable to design either a pre-fabricated type beam or type of beam in which a transverse construction joint can be used to facilitate the maintenance of traffic under one span at a time.

Recommendations

To construct underpass as proposed.

If the abutments are to be constructed on the approach fills, without the use of piles, the Materials & Research section must be notified prior to construction of the fills in order to inspect compaction.

JBC/bm

J. B. Curtis,
Bridge Location Engineer.

H. Q. GOLDER & ASSOCIATES LTD.

CONSULTING CIVIL ENGINEERS

H. Q. GOLDER
V. MILLIGAN

2446A BLOOR ST. W.
TORONTO 9
RO. 7-9201

REPORT

TO

DEPARTMENT OF HIGHWAYS, ONTARIO

ON

SITE INVESTIGATION, PROPOSED HIGHWAY 401 UNDERPASS
IROQUOIS ONTARIO

Distribution:

10 copies - Department of Highways, Ontario,
Toronto, Ontario
2 copies - H. Q. Golder & Associates Ltd.,
Toronto, Ontario.

February, 1961

6032

INDEX

	<u>Page</u>
Introduction	1
Procedure	1
Site Topography and Geology	2
Soil Conditions	3
Heterogeneous Fill	3
Clayey Till	4
Bedrock	6
Groundwater Conditions	6
Discussion	7
General	7
Foundation Design	7
Construction Procedure	9
Abbreviations	11
Records of Boreholes	In order
Figures 1 - 4 - Laboratory Tests	Following
Figure 5 - Boring Plan and Soil Strati- graphy	Page 11

ABSTRACT

The results of an investigation carried out at the site of a proposed underpass at the intersection of Highway 401 and County Road No. 2, Township of Matilda, Iroquois, Ontario are reported. It was found that the site is underlain by about 4 feet of heterogeneous fill followed by approximately 47 feet of very stiff to firm clayey till then dolomite bedrock.

Recommendations are made for founding the abutments and piers of the proposed four span underpass structure on spread footings within the clayey till stratum with maximum design loads not to exceed 4,000 pounds per square foot. It is also recommended that measures be taken to prevent softening of the clayey till by surface water during construction. The probable settlement of approach embankments and structural foundations is discussed in the report.

INTRODUCTION

1.

H. Q. Golder & Associates Ltd. has been retained by the Department of Highways, Ontario under the terms of a letter of authorization dated November 9th, 1960, to carry out an investigation for a proposed underpass at the intersection of Highway 401 and County Road No. 2, Township of Matilda, Iroquois, Ontario. The purpose of the investigation was to determine the soil conditions at the site and to provide information for the foundation design of the proposed underpass structure.

PROCEDURE

The field work for the investigation was carried out from November 15th to December 8th, 1960. Five boreholes were put down in BX size to depths of from 48 to 69 feet using a skid mounted machine drillrig and samples were taken. Three additional boreholes were put down in BX size to carry out in situ vane shear tests. Five dynamic penetration tests were also carried out. The boreholes and penetration tests were put down at the probable underpass abutment and pier locations and a plan of the site together with the inferred soil stratigraphy is shown on Figure 5. Detailed logs of each borehole are given on the Records of Boreholes.

The samples obtained during the investigation were returned to our laboratory for testing, and representative samples of those remaining after testing will be stored until July 1st, 1961 at which time you will be notified regarding their disposal.

The results of the laboratory testing are plotted on the Records of Boreholes and on the figures.

All elevations in the report are referred to geodetic datum and were determined by reference to a bench mark previously established at the site by the D.H.O. This bench mark is located in the east root of an 18 inch elm tree 238 feet right of Station 253+43, Highway 401. The elevation of this bench mark was given as 261.85, Geodetic.

SITE TOPOGRAPHY AND GEOLOGY

The site of the proposed crossing is located in a part of the St. Lawrence lowland which is characterized by ridges of ground moraine and drumlinoid features. Deposits of lacustrine or marine clays and silts in valleys and low lying section often overlie the ground moraine or till.

Within the area of the investigation no lacustrine or marine deposits were encountered, the overburden consisting of till-like material. In general the till in the Iroquois area and adjacent St. Lawrence River was the result of three major glacial movements. During the advancing and retreating phases of these major movements glacial till was deposited. This till is dense and well graded but occasionally contains pockets and lenses of sand and zones of sloughed or partially water laid glacial drift caused in part by calving during the retreating phases. Between the deposits of general till are interstage deposits of stratified sands and silts. The relationship between the interstage deposits and the three successive till

stages (usually referred to as upper, middle, and lower tills) is very complex and indeed the three till stages cannot always be distinguished. At Iroquois for example, it is possible that either the upper till has been eroded away and the middle till rests directly on bedrock or the overburden consists of a reworked till deposited in the last retreating glacial phase on a thin layer of basal till.

In general the upper portion of the till-like deposits is brown changing to grey and becoming more dense with depth.

Bedrock at Iroquois is a hard grey dolomite of the Beekmantown formation.

SOIL CONDITIONS

The following soil strata were encountered at the site:

Heterogeneous Fill

A layer of heterogeneous fill was encountered in all the boreholes at ground surface. The thickness of the fill was generally about 4 feet save in Borehole 7 where a total thickness of 9 feet was encountered.

In borehole 1, 3 and 5 the top 18 inches of fill consisted of angular crushed stone particles ranging in size from $\frac{3}{8}$ inch to 1 inch. Below this and in the other boreholes the fill consisted of a yellowish-brown sandy clay with organic material in the form of roots and pieces of wood. Occasional pebbles up to 1 inch in size were observed in the samples.

The standard penetration resistances, or 'N' values, obtained in the fill ranged from 10 to 53 blows per foot. From the pattern of dynamic penetration resistance together with the measured 'N' values, the consistency of the fill is estimated to be stiff to very stiff.

Clayey Till

Underlying the heterogeneous fill in all the boreholes was a stratum of grey clayey till, the upper few feet of which were brown in colour. The thickness of the stratum was determined to be about 47 feet in three of the boreholes and was estimated to be of the same order in the other two as complete refusal to washing and sampling was met at an overall depth of about 50 feet.

The stratum contained sub-angular pebbles between 1/2 inch and 3/4 inch size with very occasional pebbles of 1 1/2 inch size. Erratic layers of silt about 1/2 inch in thickness and seams of fine sand about 1/8 inch in thickness were also encountered. At a depth of 47 feet in Borehole 9 a layer of dense grey silt about 3 feet in thickness was encountered immediately overlying bedrock. Generally however the till was well graded and compares in gradation with reports by others in this area.*1,*2,*3. Representative grain size distribution

*1. 'Tests on Glacial Till'. J.I.Adams, Proceedings of 14th Canadian Soil Mech. Conf. 1960

*2 'Soils and Earthwork Features of St. Lawrence River Power and Seaway Projects'. R.M.Haines and G.E.Olson.

*3 'Earth Excavation Methods and Related Soils Problems on St. Lawrence Power and Seaway Projects'. E.L.Armstrong and R.E.Burnett.

*2 and *3 Papers presented at the Summer Convention, A.S.C.E., Buffalo, 1957

curves are plotted in Figures 1 and 2.

The liquid limit of the material was generally about 15 per cent and the plastic limit about 10 per cent. One liquid limit of 55 per cent and plastic limit of 20 per cent was obtained for a sample of yellowish-brown clay from the upper part of the stratum in Borehole 1. Natural water contents were generally at or below the plastic limit and in the range of 8 to 11 per cent.

The wet unit weight of samples ranged from 135 to 153 pounds per cubic foot with an average value of 145 pounds per cubic foot.

In situ vane shear tests were carried out in three boreholes. The results of these tests are plotted on the Records of Boreholes together with the results of undrained triaxial tests on undisturbed samples. It may be noted that in the upper 10 feet of the stratum the measured shear strengths in both vane and triaxial tests were high and of the order of 2,000 pounds per square foot or higher. Below this depth the shear strength reduced to a minimum value of about 500 pounds per square foot measured in triaxial tests and about 1,000 pounds per square foot measured in field vane tests. The discrepancy in measured shear strength between compression and vane shear tests is possibly due to the presence of gravel in the till which increased the value measured in the vane tests and/or the high sand content of the samples which decreased the values

measured in the compression tests. Sensitivity of the clayey till as measured in vane tests was about 1.5 to 2.0. The consistency of the material is estimated to be at least very stiff to firm.

The pattern of the shear strength with depth suggests that the material is a 'softened' or 'reworked' till with desiccation close to ground surface. Three consolidation tests were carried out on samples from Borehole 9. The results of the consolidation tests are plotted on Figure 4. The general value of C_c inferred from the results of the oedometer tests is about 0.05. These results, together with the fact that the natural water content of the material is at or below the plastic limit, indicate that the compressibility of the stratum is low.

Bedrock

Bedrock was proved in Boreholes 1, 5, and 9 by taking 15 feet of AXT core in each. It was a hard sound grey dolomite with occasional softer light bands. It is probably of the Beekmantown formation.

Groundwater Conditions

Groundwater levels in the boreholes at the end of the investigation were observed to be from 1 to 4 feet below ground surface or between elevations 260 and 262.

DISCUSSION

General

It is understood that it is proposed to construct a four span underpass structure at the intersection of Highway 401 and County Road No. 2, Township of Matilda, Iroquois, Ontario. No structural details are available at this time but it is assumed that the underpass will be a simple reinforced concrete structure. The proposed locations of piers and abutments are shown on Figure 5.

Foundation Design

It is recommended that the structure be founded on spread footings in the clayey till stratum. Penetration to foundation grade should be at least 1 foot into the stratum. As the thickness of existing fill at the site is generally about 4 feet, this will give about 5 feet of earth cover above foundation grade which will be adequate for frost protection to the clayey till.

The allowable bearing capacity of the till is estimated from several factors which are noted below:

- i) Dynamic penetration tests invariably met practical refusal after penetration of a few feet into the stratum indicating that the upper dessicated crust is very stiff;
- ii) The measured wet unit weight of samples of the till consistently indicated an extremely high relative density;

iii) Samples of the till had a low plasticity index and the natural water content was at or below the plastic limit; consequently the relief of vertical stress in wash borings would soften that portion of the till which was then sampled. It is for this reason that laboratory compression tests probably give too low a value. While the use of in situ vane tests in such a well graded material is subject to question, it is probable that the vane tests more accurately reflect the shearing resistance of the till than laboratory compression tests on softened samples.

Taking these factors into consideration, an allowable bearing capacity of greater than 5,000 pounds per square foot is possible for footings founded at this depth. However, to allow for possible softening of the clayey till during construction and to minimize overstressing of possible softer zones within the stratum at depth, it is recommended that the maximum design loads not exceed 4,000 pounds per square foot. Settlement of piers when founded as recommended should be less than 1 inch.

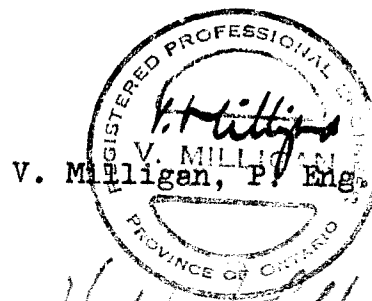
The settlement of abutments will largely be governed by the settlement of the approach fills. No details are available concerning the height of approach embankments and the overall grade of the structure. It is assumed however, that the revised grade will be at about elevation 280 to 285 and that approach fills will be 20 to 25 feet in height. At this height and with side slopes of 2 horizontal to 1 vertical there is an

adequate factor of safety against circular arc type failure in the fill. The compressibility of the clayey till is low and the total settlement of approach fills due to consolidation of the till should be small and less than 2 inches. Settlement due to increase in density of the embankment itself, if clean granular fill, would largely take place during construction. It is concluded therefore that the abutments may be founded with an allowable bearing pressure of 4,000 pounds per square foot and that the settlement of the abutments would be small and of the same order as that for the piers. Consequently differential settlement along the underpass structure and between successive spans should be certainly less than 1 inch and well within tolerable limits for the structure.

Construction Procedure

Construction of the proposed footings will necessitate excavation through existing heterogeneous fill and as much as 4 feet below groundwater level. In view of the high density of the clayey till and its comparatively low permeability, little difficulty need be expected due to seepage of groundwater into excavations. Surface water run-off should be prevented from entering the excavation by perimeter drains. However, it is recommended that the base of pier and abutment excavations be sealed with lean concrete immediately on exposure to prevent softening due to surface water. It should also be specified that the abutments be backfilled with clean granular material

placed in well compacted layers not exceeding 6 inches in thickness.



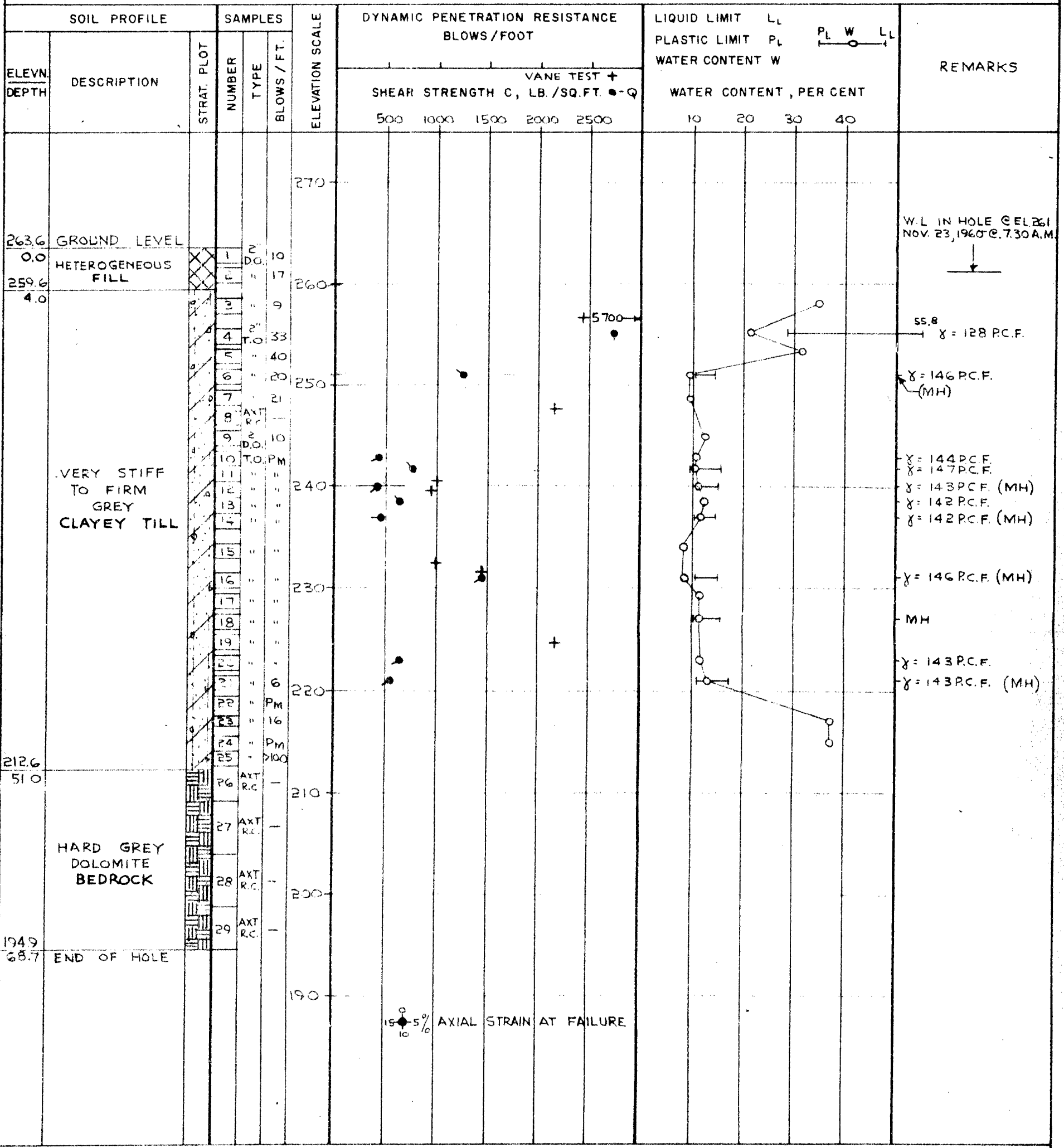
V. Milligan, P. Eng.

H. Q. Golder, P. Eng.

VM:IMB
6032
February, 1961

RECORD OF BOREHOLE 1

LOCATION SEE FIGURE 5 BORING DATE NOV. 17-22, 1960 DATUM GEODETIC
BOREHOLE TYPE WASH BORING BOREHOLE DIAMETER BX CASING
SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES



RECORD OF BOREHOLE 2

LOCATION SEE FIGURE 5 BORING DATE NOV. 23, 1960 DATUM GEODETIC
 BOREHOLE TYPE PENETRATION TEST BOREHOLE DIAMETER —
 SAMPLER HAMMER WEIGHT — LB. DROP — INCHES PEN TEST HAMMER WEIGHT 140 LB. DROP 30 INCHES

SOIL PROFILE			SAMPLES		ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT L _L			
ELEVN.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS / FOOT					PLASTIC LIMIT P _L			
DEPTH						20	40	60	80	100	WATER CONTENT W			
						SHEAR STRENGTH C, LB./SQ.FT.					WATER CONTENT, PER CENT			
					270									
260.4	GROUND LEVEL				260									
0.0					250									
					240									
					230									
226.6					220									
33.8	END OF PEN. TEST													

100 BLOWS FOR LAST 10 INCHES

VERTICAL SCALE
1 INCH TO 10 FEET

GOLDER & ASSOCIATES

DRAWN J.A.
CHECKED S.G.S.

RECORD OF BOREHOLE 3

LOCATION SEE FIGURE 5

BORING DATE

NOV. 24-25, 1960

DATUM

GEODETIC

BOREHOLE TYPE

WASH BORING

BOREHOLE DIAMETER

8X CASING

SAMPLER HAMMER WEIGHT 140 LB

DROP 30 INCHES

PEN TEST HAMMER WEIGHT — LB.

DROP — INCHES

SOIL PROFILE			SAMPLES		ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT					LIQUID LIMIT L_L PLASTIC LIMIT P_L $\frac{P_L}{W} \frac{L_L}{L_L}$ WATER CONTENT W				REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		SHEAR STRENGTH C , LB./SQ.FT.					WATER CONTENT, PER CENT				
264.0	GROUND LEVEL				270										W.L. IN CASING @ EL 261 NOV. 25, 1960 @ 7.30 A.M. <div>+</div>
0.0	HETEROGENEOUS FILL				260										
259.5			1	2" T.O.	250										
4.5			2	"	240										
			3	"	230										
			4	"	220										
			5	"	210										
			6	"	200										
			7	"	190										
			8	"	180										
			9	"	170										
			10	"	160										
			11	"	150										
			12	"	140										
			13	"	130										
			14	"	120										
			15	"	110										
			16	"	100										
212.8					210										
51.2	END OF HOLE														

 VERTICAL SCALE
 1 INCH TO 10 FEET

GOLDER & ASSOCIATES

 DRAWN J.A.
 CHECKED S.G.S.

RECORD OF BOREHOLE 4

LOCATION SEE FIGURE 5 BORING DATE NOV. 15, 1960 DATUM GEODETIC
 BOREHOLE TYPE PENETRATION TEST BOREHOLE DIAMETER —
 SAMPLER HAMMER WEIGHT — LB. DROP — INCHES PEN. TEST HAMMER WEIGHT 140 LB. DROP 30 INCHES

SOIL PROFILE			SAMPLES		ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT L _L PLASTIC LIMIT P _L WATER CONTENT W			
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		20	40	60	80	100	P _L W L _L			
						SHEAR STRENGTH C, LB./SQ.FT.					WATER CONTENT, PER CENT			
264.9 0.0	GROUND LEVEL				270									
254.7 10.2	END OF PEN. TEST				260									
					250									

DRILLED THROUGH PAVEMENT

80 BLOWS FOR LAST 4 INCHES

VERTICAL SCALE
 1 INCH = 10 FEET

GOLDER & ASSOCIATES

DRAWN J.A.
 CHECKED S.G.S.

RECORD OF BOREHOLE 5

LOCATION SEE FIGURE 5 BORING DATE NOV. 28-30, 1960 DATUM GEODETIC
 BOREHOLE TYPE WASH BORING BOREHOLE DIAMETER BX CASING
 SAMPLER HAMMER WEIGHT 140 LB DROP 30 INCHES PEN TEST HAMMER WEIGHT LB DROP INCHES

SOIL PROFILE			SAMPLES		ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT L_L PLASTIC LIMIT P_L WATER CONTENT W				REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE		VANE TEST + SHEAR STRENGTH C , LB / SQ. FT					WATER CONTENT, PER CENT				
						500	1000	1500	2000	2500					
264.6	GROUND LEVEL				270										W.L. IN HOLE @ E.L. 260.8 DEC 3, 1960 @ 7.30 A.M. ↓
0.0	HETEROGENEOUS FILL				260										
260.1			1	T.O.	20										
4.5			2	"											
			3	"	16										
			4	"	7										
	VERY STIFF TO FIRM GREY CLAYEY TILL		5	"	5										
			6	"	3										
			7	"	29										
			8	"	13										
			9	"	11										
			10	"	9										
213.0			11	AXT R.C.	210										
51.6			12	"											
	HARD GREY DOLOMITE BEDROCK		13	"	200										
196.8					190										
67.8	END OF HOLE														











VERTICAL SCALE
1 INCH TO 10 FEET

GOLDER & ASSOCIATES

DRAWN J.A.
CHECKED S.S.S.

RECORD OF BOREHOLE 7

LOCATION SEE FIGURE 5 BORING DATE NOV. 26-28, 1960 DATUM GEODETIC
 BOREHOLE TYPE WASH BORING BOREHOLE DIAMETER 8X CASING
 SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

SOIL PROFILE			SAMPLES		ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT					LIQUID LIMIT L_L PLASTIC LIMIT P_L P_L W L_L WATER CONTENT W				REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		SHEAR STRENGTH C , LB./SQ.FT.					WATER CONTENT, PER CENT				
261.3 0.0	GROUND LEVEL				270										W.L. IN HOLE @ EL. 260.3 NOV. 29, 1960 @ 7.30 A.M. <div>↓</div>
	HETEROGENEOUS FILL		1	2" T.O.	53										
252.3 9.0			2	"	24	250									
			3	"	8										
			4	"	8	240									
	VERY STIFF TO FIRM GREY CLAYEY TILL		5	"	7										
			6	"	6	230									
			7	"	32										
			8	"	14	220									
			9	"	8										
213.8 47.5	END OF HOLE		10	"		210									

VERTICAL SCALE
 1 INCH TO 10 FEET

GOLDER & ASSOCIATES

DRAWN J.A.
 CHECKED S.G.S.

RECORD OF BOREHOLE 8

LOCATION SEE FIGURE 5 BORING DATE DEC. 8, 1960 DATUM GEODETIC
BOREHOLE TYPE PENETRATION TEST BOREHOLE DIAMETER
SAMPLER HAMMER WEIGHT — LB. DROP — INCHES PEN. TEST HAMMER WEIGHT 140 LB. DROP 30 INCHES

SOIL PROFILE			SAMPLES			ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT L _L			
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FT.		, BLOWS / FOOT — * — * — *					PLASTIC LIMIT P _L			
							20	40	60	80	100	WATER CONTENT W			
							SHEAR STRENGTH C, LB. / SQ. FT.					WATER CONTENT, PER CENT			
						270									
264.0	GROUND LEVEL														
0.0															
256.0															
8.0	END OF PEN TEST														
						250									

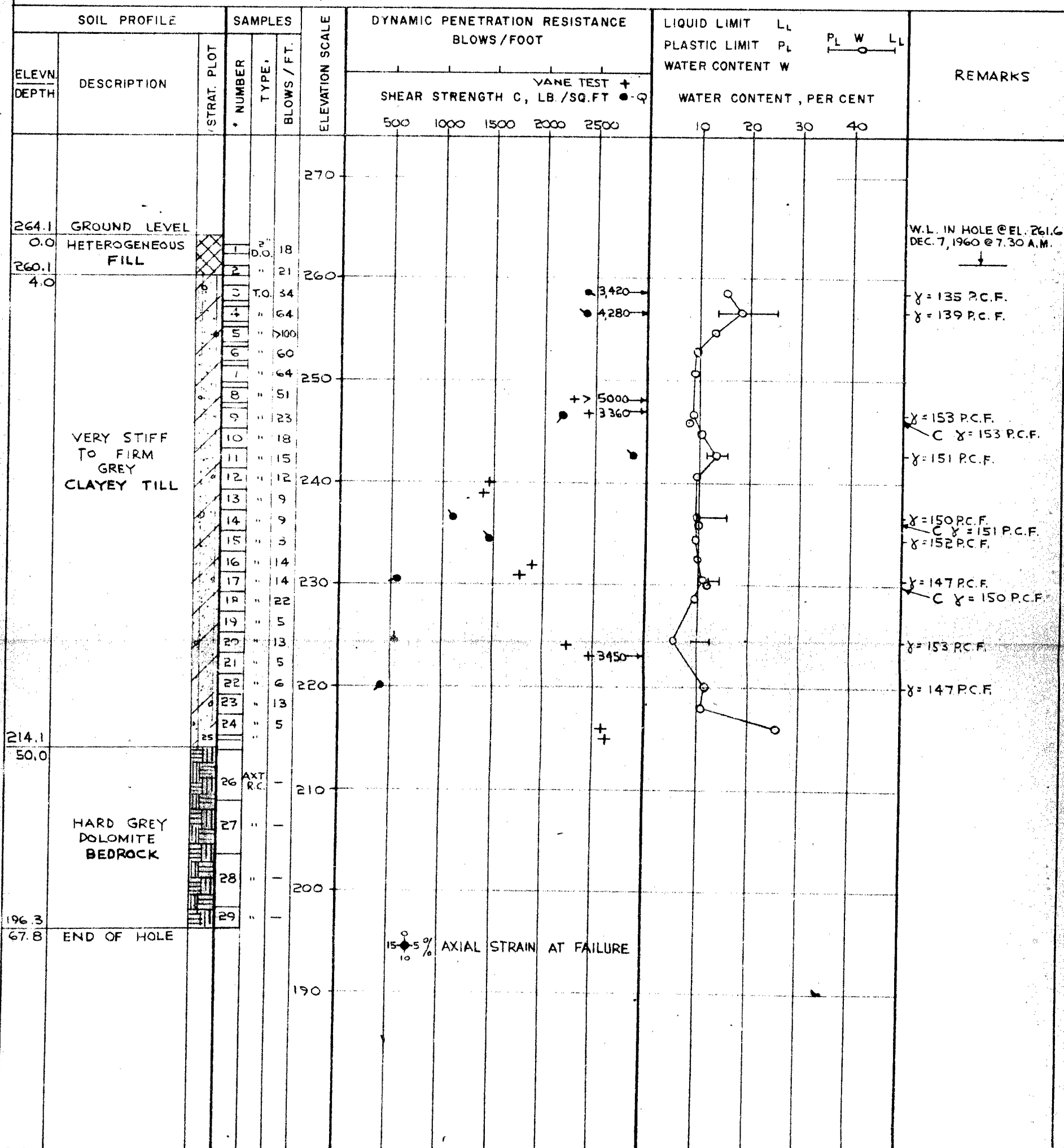
VERTICAL SCALE
1 INCH TO 10 FEET

GOLDER & ASSOCIATES

DRAWN J.A.
CHECKED S.G.S.

RECORD OF BOREHOLE 9

LOCATION SEE FIGURE 5 BORING DATE DEC. 2-6, 1960 DATUM GEODETIC
 BOREHOLE TYPE WASH BORING BOREHOLE DIAMETER BX CASING
 SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES



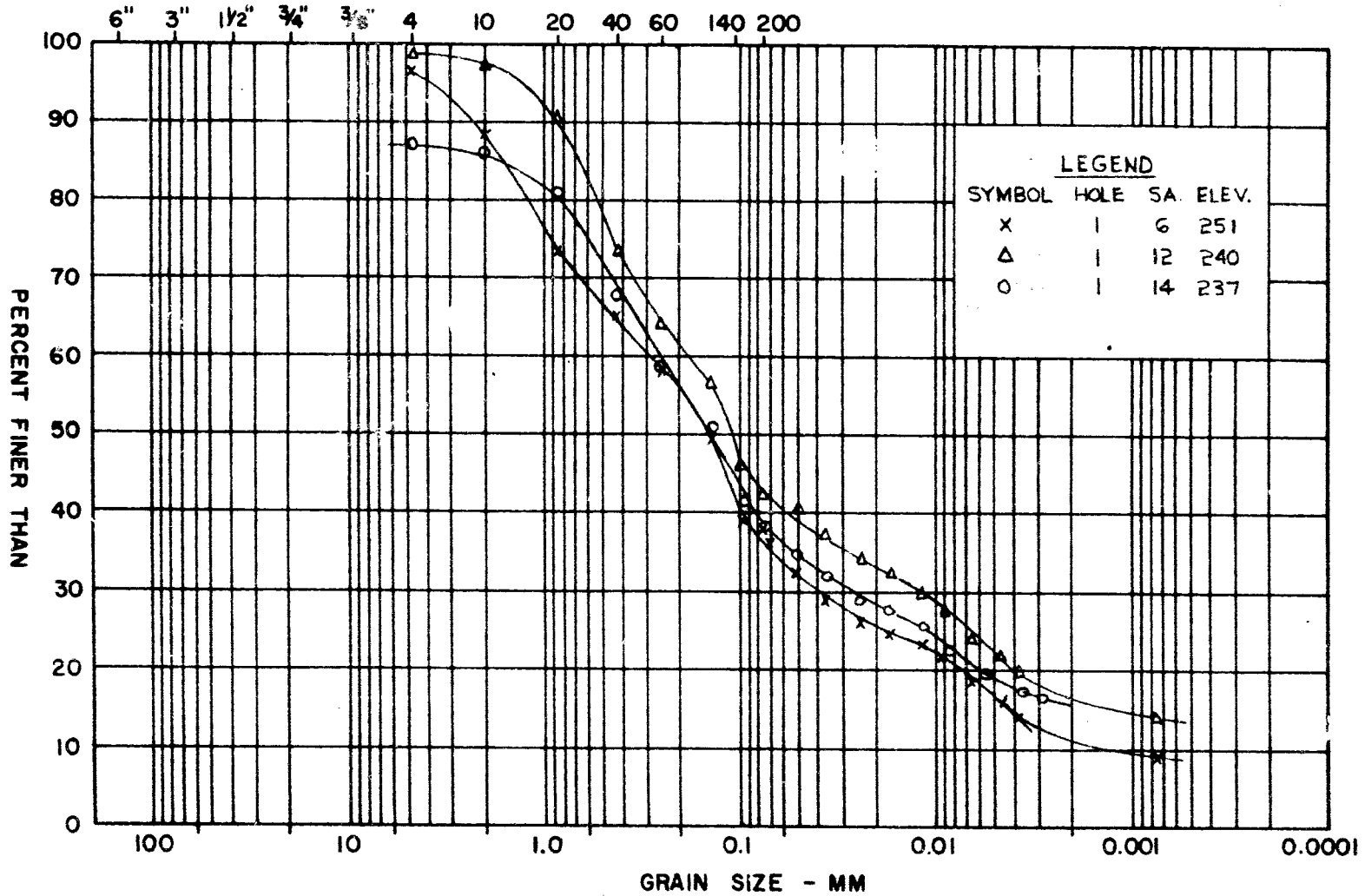
VERTICAL SCALE
1 INCH TO 10 FEET

GOLDER & ASSOCIATES

DRAWN J A
CHECKED S. G. S.

M.I.T. GRAIN SIZE SCALE

SIZE OF OPENING - INS. U.S.S. SIEVE SIZE - MESHES/IN.

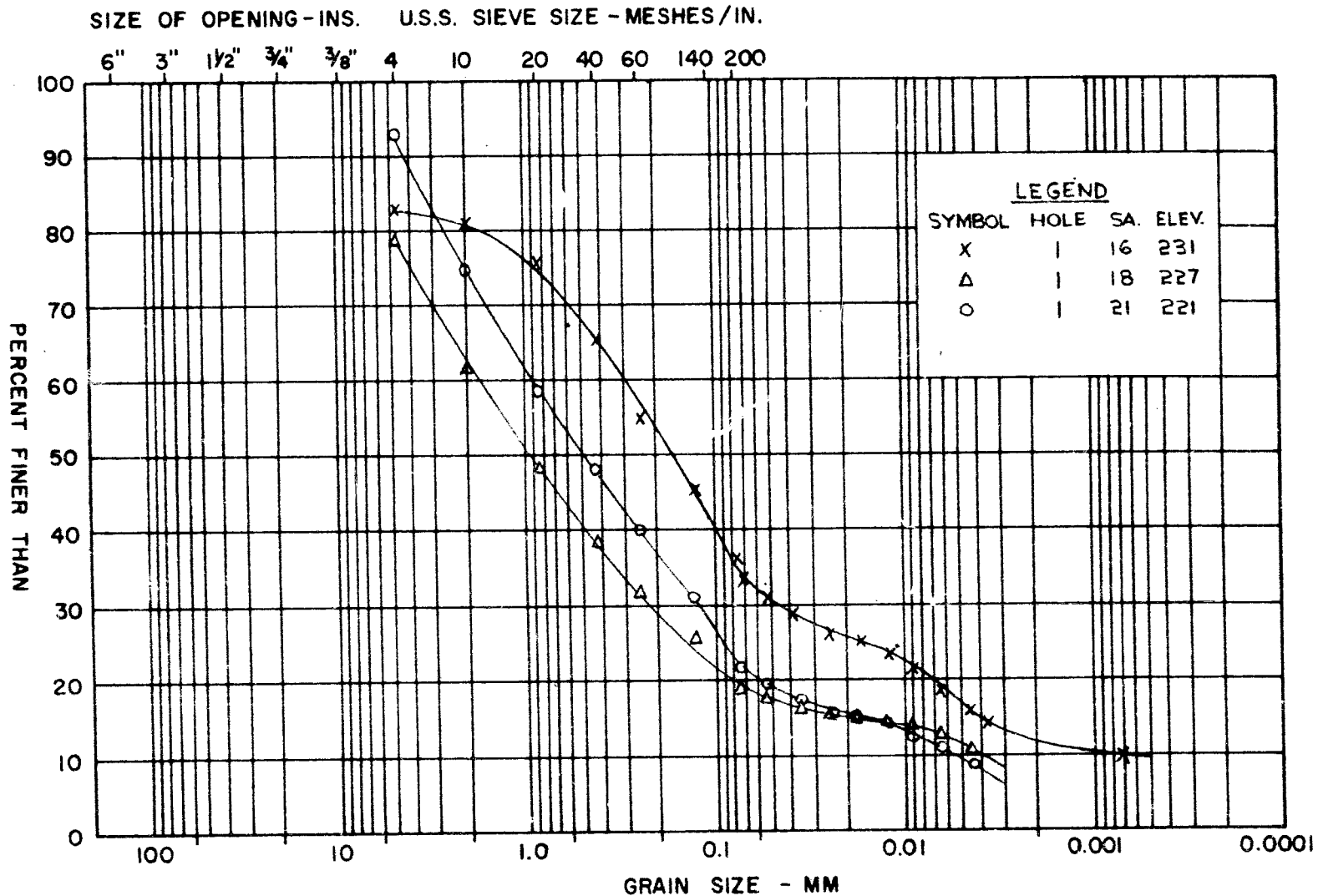


GOLDER & ASSOCIATES

GRAIN SIZE DISTRIBUTION
CLAYEY TILL STRATUM

FIGURE 1

M.I.T. GRAIN SIZE SCALE



GOLDER & ASSOCIATES

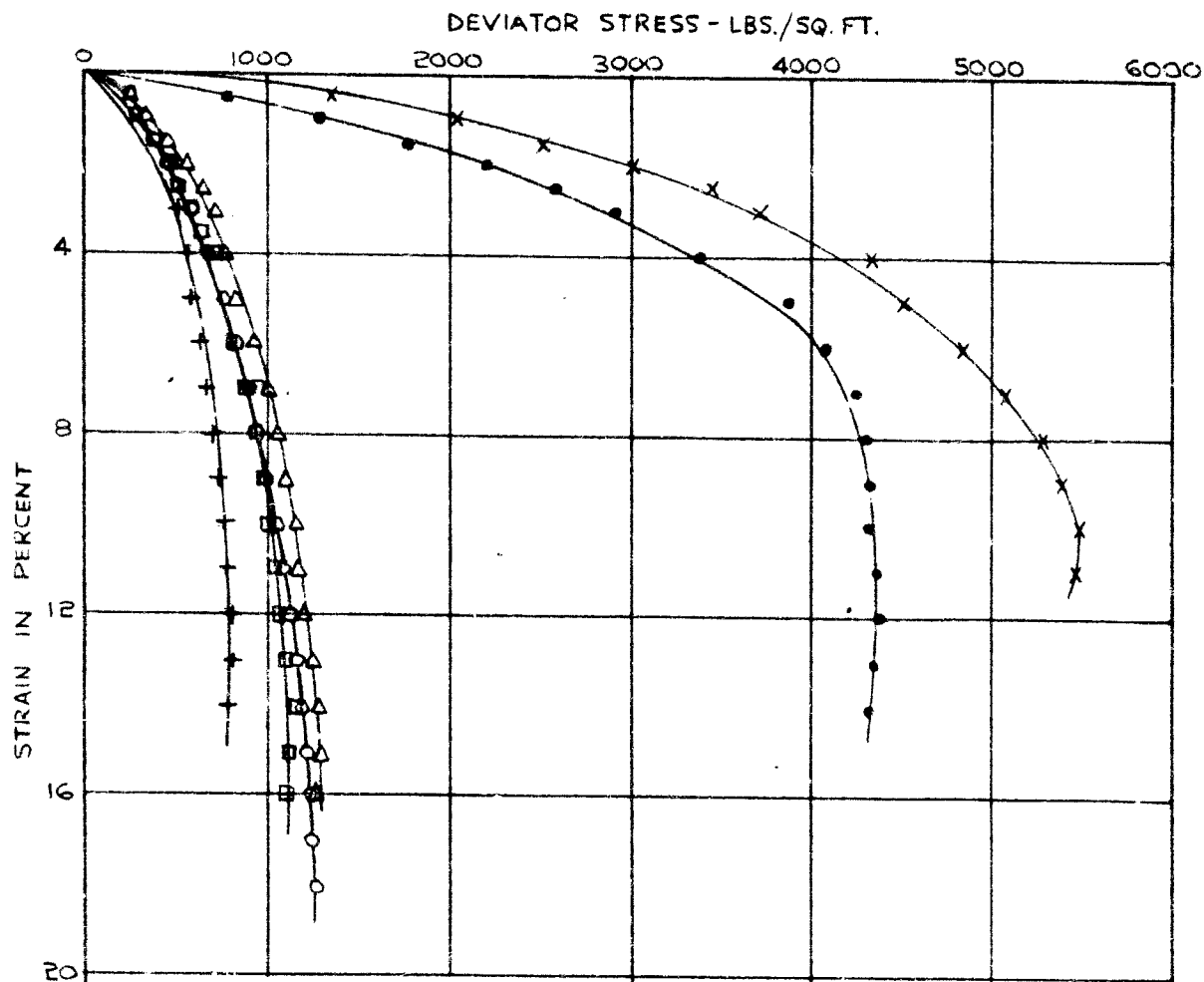
GRAIN SIZE DISTRIBUTION
CLAYEY TILL STRATUM

FIGURE 2

UNDRAINED TRIAXIAL COMPRESSION TESTS

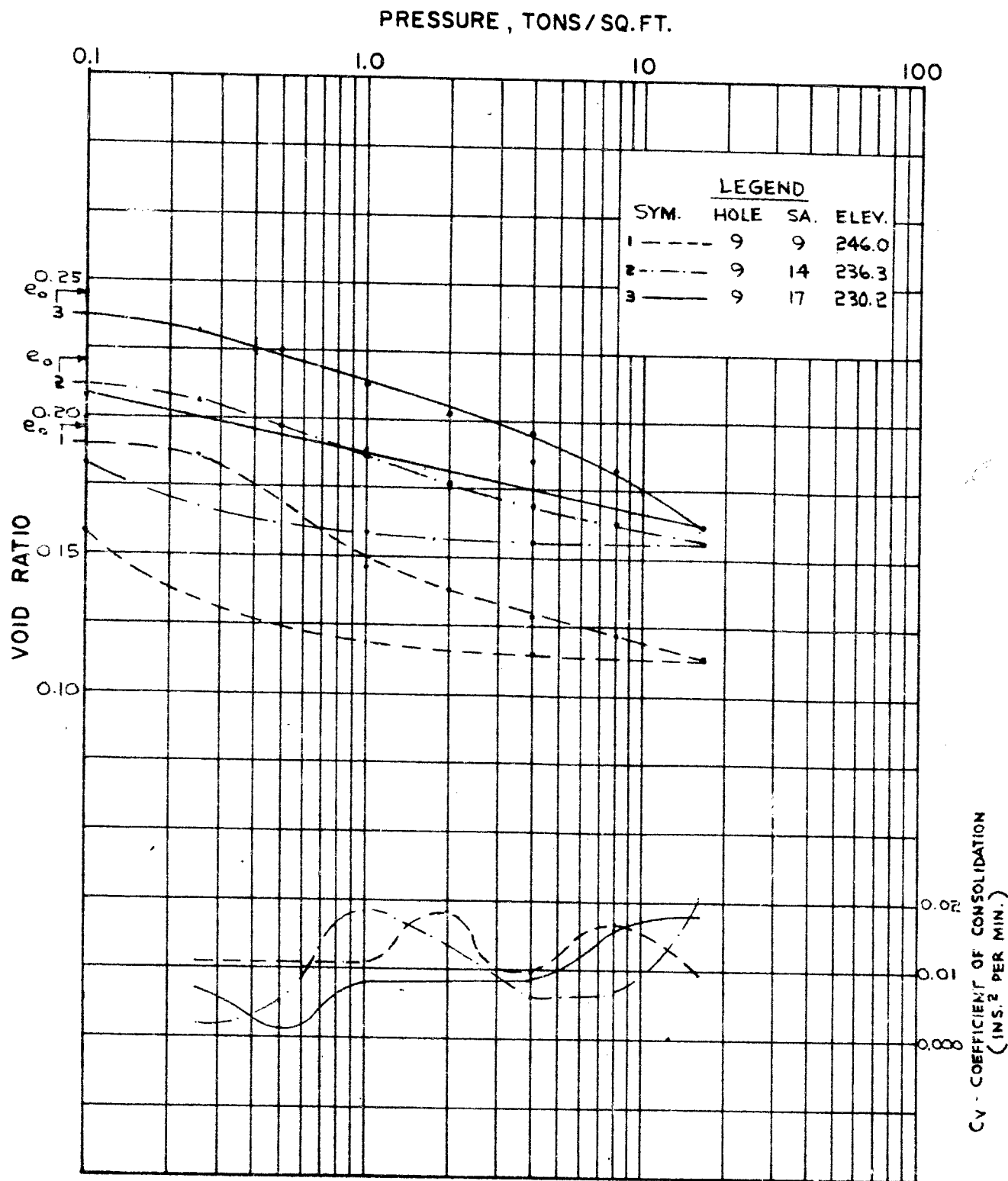
TYPICAL STRESS-STRAIN CURVES

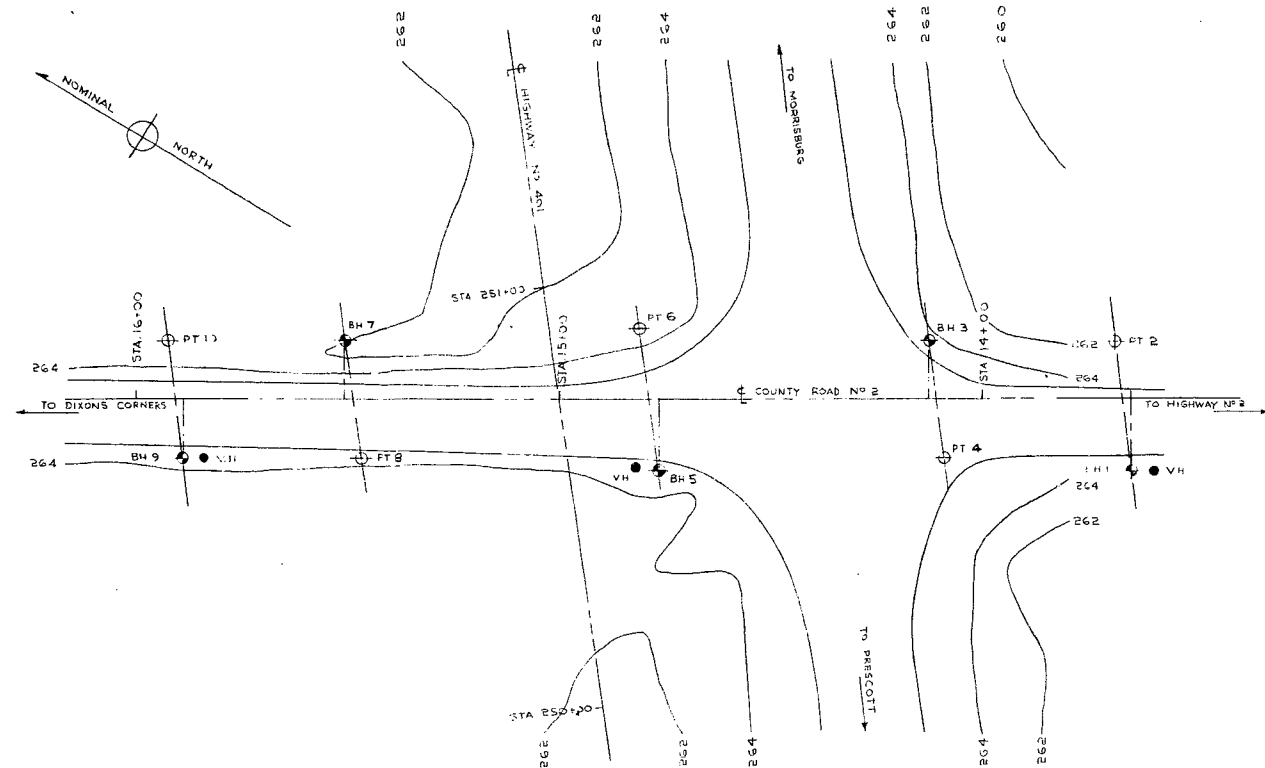
FIGURE 3



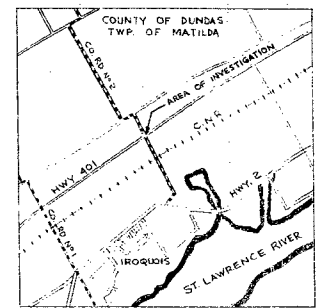
VOID RATIO - PRESSURE CURVES CONSOLIDATION TEST

FIGURE 4

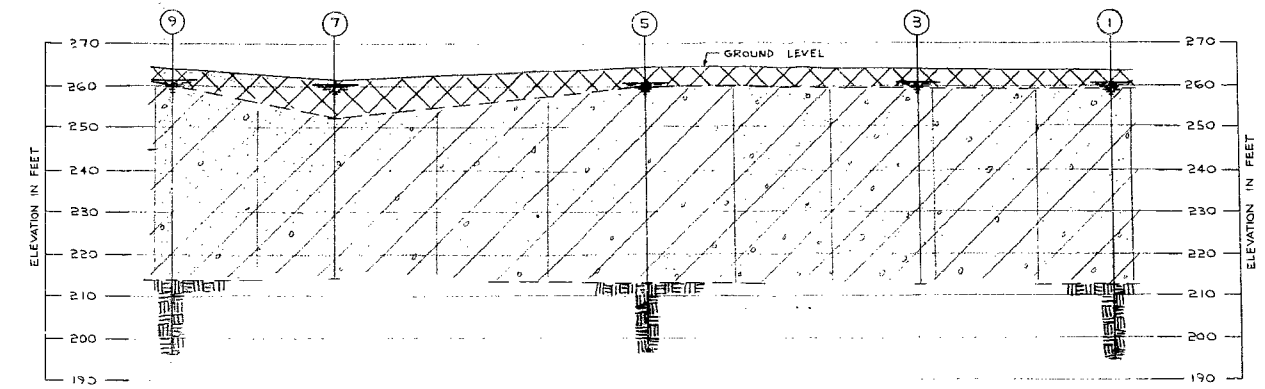




PLAN
SCALE: 1" TO 20'-0"



KEY PLAN
SCALE: 1" TO 1 MILE



SCHEMATIC SECTION ALONG CL - COUNTY ROAD NO. 2
SCALE: 1" TO 20'-0"

LEGEND

- BOREHOLE IN PLAN
- BOREHOLE IN ELEVATION
- PENETRATION TEST IN PLAN
- VANE HOLE IN PLAN
- WATER LEVEL IN HOLE DURING INVESTIGATION

STRATIGRAPHY

- HETEROGENEOUS FILL
- VERY STIFF TO FIRM GREY CLAYEY TILL
- HARD GREY DOLOMITE BEDROCK

SPECIAL NOTE: DATA CONCERNING THE VARIOUS STRATA HAS BEEN OBTAINED AT BOREHOLE LOCATIONS ONLY. THE STRATIGRAPHY BETWEEN BOREHOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.

REFERENCE	
DRWG. No.	DESCRIPTION
E 3794-1	DEPARTMENT OF HIGHWAYS, ONTARIO PROPOSED CROSSING AT COUNTY ROAD NO. 2 AND HIGHWAY NO. 401 LINE 'B', DATED MARCH '60

DEPARTMENT OF HIGHWAYS, ONTARIO	
TORONTO	ONTARIO
PROPOSED HIGHWAY 401 UNDERPASS	
IROQUOIS	ONTARIO
BORING PLAN AND SOIL STRATIGRAPHY	

GOLDER & ASSOCIATES	
CONSULTING CIVIL ENGINEERS	
DATE: DEC. 14, 1960 SCALE: 1" TO 20'-0"	
MADE J.A.	CHKD. S.G.S.
APPD. J.A.	FIGURE 5